

FIG. 1

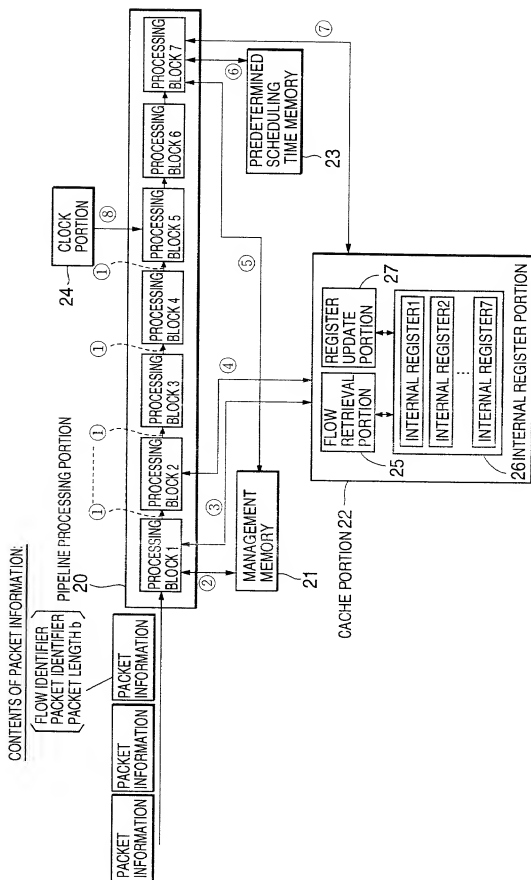


FIG.2

NETWORK MODEL

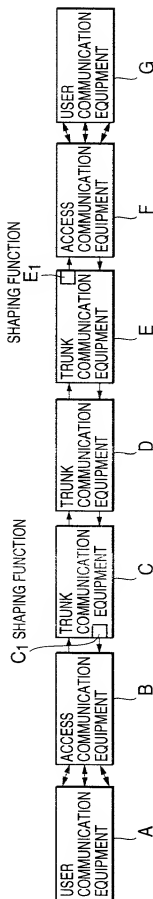


FIG.3

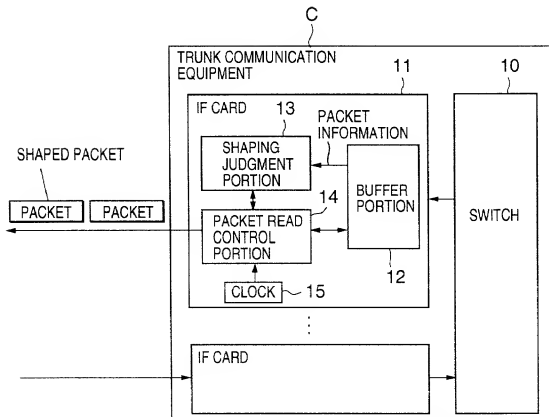


FIG.4

CONTENTS OF SIGNALS BETWEEN BLOCKS :

- ① SIGNALS BETWEEN PROCESSING BLOCKS IN PIPELINE PROCESSING PORTION
FLOW IDENTIFIER, PACKER IDENTIFIER, TK, L, P, P¹; Ibit, X, Y, Z, W, I2bit, Y2 AS INTERNAL CONVERSION
- ② FLOW IDENTIFIER AS MANAGEMENT MEMORY ADDRESS; TK, L, P, RT AS DATA
- ③ PROCESSING BLOCK 1 → FLOW IDENTIFIER IN CACHE PORTION, CACHE PORTION → K, B IN PROCESSING BLOCK 1
- ④ PROCESSING BLOCK 2 → FLOW IDENTIFIER, PACKET LENGTH_b IN CACHE PORTION
- ⑤ FLOW IDENTIFIER AS MANAGEMENT MEMORY ADDRESS, TOKEN ADDED VALUE TK,
TOKEN ADDITION INTERVAL L AS DATA, P = W AS NEW TOKEN VALUE, AND RT = Z AS NEW PREDETERMINED SCHEDULING TIME
- ⑥ PREDETERMINED SCHEDULING TIME Z, PACKET IDENTIFIER
- ⑦ PROCESSING BLOCK 7 → FLOW IDENTIFIER, PACKET LENGTH_b IN CACHE PORTION
- ⑧ CURRENT TIME NT

FIG.5(A)

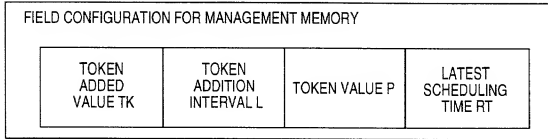


FIG.5(B)

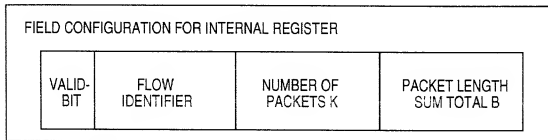


FIG.5(C)

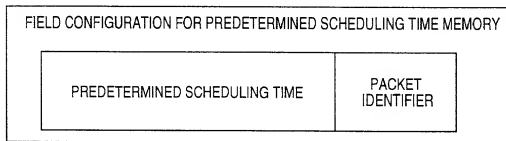


FIG.6

PROCESSING FLOW OF PIPELINE PROCESSING PORTION

PROCESSING BLOCK 1

ASSIGN FLOW IDENTIFIER OF INPUT PACKET TO MANAGEMENT MEMORY AS ADDRESS AND OBTAIN TOKEN ADDED VALUE TK, TOKEN ADDITION INTERVAL L, TOKEN VALUE P, AND LATEST SCHEDULING TIME RT OF RELEVANT FLOW. ASSIGN FLOW IDENTIFIER OF INPUT PACKET TO CACHE PORTION AND OBTAIN NUMBER OF PACKETS K AND PACKET LENGTH SUM TOTAL B IN PIPELINE PROCESSING PORTION OF RELEVANT FLOW AS RETRIEVAL RESULT IN CACHE PORTION.

PROCESSING BLOCK 2

- 1) WHEN $K = 0$, CALCULATE $X = P - b$, AND
 $fbit = 1$ IF $X > 0$
 $fbit = 0$ IF $X \leq 0$.
- 2) WHEN $K > 0$, CALCULATE $X = P - (B + b)$, AND
 $fbit = 1$ IF $X > 0$
 $fbit = 0$ IF $X \leq 0$.
- 3) SEND FLOW IDENTIFIER AND PACKET LENGTH b TO CACHE PORTION.

PROCESSING BLOCK 3

WHEN $fbit = 1$, CALCULATE $Y = 1/TK$.
 WHEN $fbit = 0$, CALCULATE $Y = (1/x + 1)/TK$.

PROCESSING BLOCK 4

$z = Y \times L + RT$,
 $w = X \times 1$ ($fbit = 1$),
 $w = 0$ ($fbit = 0$)

PROCESSING BLOCK 5

WHEN $NT > Z$, $f2bit = 0$.
 WHEN $NT \leq Z$,
 CALCULATE $Y2 = (NT - Z)/TK$, AND $f2bit = 1$

PROCESSING BLOCK 6

WHEN $f2bit = 1$, $Z = NT$, AND CALCULATE
 $W = W + NT - Z$.

PROCESSING BLOCK 7

- 1) REGISTER Z AND PACKET IDENTIFIER IN PREDETERMINED SCHEDULING TIME MEMORY.
- 2) WRITE TK , L , W , Z TO MANAGEMENT MEMORY USING FLOW IDENTIFIER AS ADDRESS.
- 3) SEND FLOW IDENTIFIER AND b TO CACHE PORTION.

PROCESSING OUTLINE OF CACHE PORTION

RECEIVE A FLOW IDENTIFIER FROM PROCESSING BLOCK 1 AND RETRIEVE THE FLOW IDENTIFIER REGISTERED IN AN INTERNAL REGISTER.

IF REGISTERED, RETURN THE NUMBER OF PACKETS K AND THE SUM TOTAL B OF A PACKET LENGTH CONTAINED IN THE RELEVANT INTERNAL REGISTER TO THE PROCESSING BLOCK 1. IF NOT REGISTERED, RETURN $K = 0$.

RECEIVE A FLOW IDENTIFIER $flowinfo1$ AND A PACKET LENGTH $pktlen1$ FROM PROCESSING BLOCK 2 AND RECEIVE A FLOW IDENTIFIER $flowinfo2$ AND A PACKET LENGTH $pktlen2$ FROM PROCESSING BLOCK 7.

■ WHEN $flowinfo1 = flowinfo2$:
 RETRIEVE AN INTERNAL REGISTER HAVING THE FLOW IDENTIFIER OF $flowinfo1$ AND UPDATE THE NUMBER OF PACKETS $K = K$ AND THE PACKET LENGTH SUM TOTAL
 $B = B + pktlen1 - pktlen2$.

■ WHEN $flowinfo1 \neq flowinfo2$:

① PROCESSING CONCERNING PROCESSING BLOCK 2

RETRIEVE AN INTERNAL REGISTER HAVING THE FLOW IDENTIFIER OF $flowinfo1$ AND UPDATE $K = K + 1$ AND $B = B + pktlen1$. IF THE RELEVANT INTERNAL REGISTER IS NOT PROVIDED, NEWLY REGISTER $K = 1$, valid-bit = on, AND $B = pktlen1$.

② PROCESSING CONCERNING PROCESSING BLOCK 7

RETRIEVE AN INTERNAL REGISTER HAVING THE FLOW IDENTIFIER OF $flowinfo2$ AND UPDATE $K = K - 1$ AND $B = B - pktlen2$. IF $K = 1$ IS FIRST RETRIEVED FROM THE RELEVANT INTERNAL REGISTER, UPDATE ONLY valid-bit = off.

FIG.7

EXPLANATION OF VARIABLES :	
①	READ FROM MANAGEMENT MEMORY TK = TOKEN ADDED VALUE L = TOKEN ADDITION INTERVAL P = TOKEN VALUE RT = LATEST SCHEDULING TIME
②	READ FROM CACHE PORTION K = NUMBER OF PACKETS B = PACKET LENGTH SUM TOTAL valid-bit = REGISTER ENABLED AND DISABLED
③	INTERNAL VARIABLES fbit = IDENTIFICATION AS TO WHETHER TOKEN IS SUFFICIENT X = INSUFFICIENT TOKEN AMOUNT Y = NUMBER OF NECESSARY TOKEN ADDITION INTERVALS Z = NEWLY PREDETERMINED SCHEDULING TIME W = NEW TOKEN VALUE f2bit = NEWLY PREDETERMINED SCHEDULING TIME INDICATES CROSS REFERENCE BETWEEN Z AND CURRENT TIME. Y2 = Z AND NUMBER OF TOKEN ADDITION ITEMS ADDED UNTIL CURRENT TIME
④	OTHERS b = PACKET LENGTH OF PROCESSING PACKET NT = CURRENT TIME

FIG.8

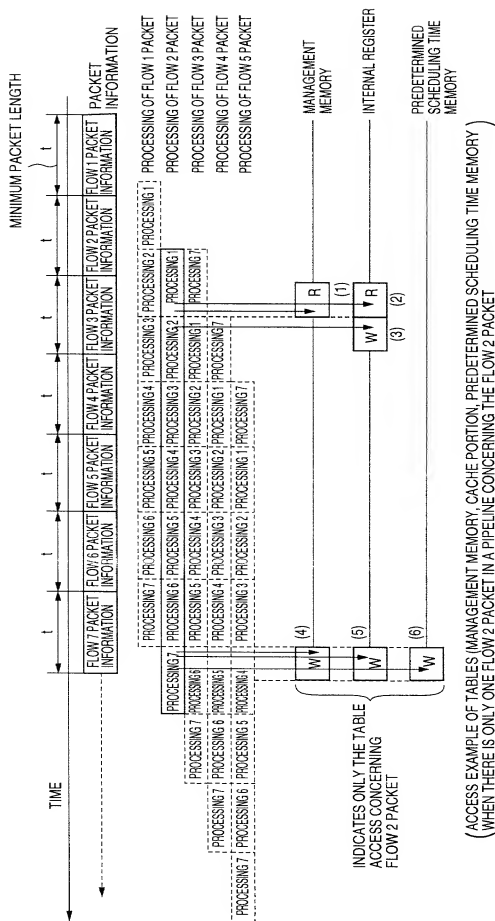


FIG.10

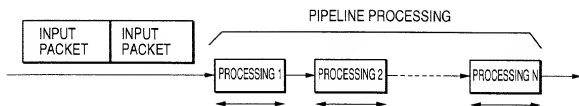


FIG.11

